

To: Griswold, Hays[Griswold.Hays@epa.gov]; Hestmark, Martin[Hestmark.Martin@epa.gov]; McGrath, Shaun[McGrath.Shaun@epa.gov]
From: Ron Stone
Sent: Tue 8/11/2015 9:24:44 PM
Subject: FTT Case Studies - Mining Sector, For Immediate Attention
10. EPA DW Report 600 R-14 376 with Highlights.pdf

Attn: Mr. Griswold and Mr. Hestmark

Gentleman -

You both are very busy with the spill so I will get to the point. Please see the scientific data provided below. These case studies have already been conducted with highly pedigreed, major companies in the mining industry. This information may helpful with your evaluation of FTT's usefulness in the clean-up effort. These results are relative to arsenic, cyanide, lead, cadmium, iron, manganese, zinc, aluminum and nickel. Your circumstance will require information of what levels you are trying to achieve; which, of course, is readily done through water analysis and bench-testing. Our Ferrator unit sizes handle between 3MGD to 60MGD depending on the circumstance, are mobile, and can be set up without requiring massive engineering set-up or the relative exorbitant costs typically associated with other competing technologies. Our 3mgd ferrator is 2.5'x3.5'x6.5'. Our 60mgd ferrator is 45'x8'x11', with various other sizes in between. Our chemistry also flocculates and coagulates while disinfecting water, and the byproduct is 100% environmentally friendly. The bench-test studies can be conducted by FTT and we can provide the results exclusively for your department's review in determining if this is possibly a solution that may satisfy your requirements. The costs to run these tests are minimal.

Our company has technology that may be of some great use to the challenges pertaining to the Colorado Gold King Mining spill. It might be possible to help at 1) the source, 2) at key points along the river(s), 3) maybe at the point of entry at Lake Powell, and 4) for the Navajo Nations territorial concerns. Since our units are mobile and transportable, this may be a viable solution for cleaning water for livestock and agricultural resources in the region while also assisting with the contamination concerns now and into the future. Let's agree this will require review on your team's part.

Additionally, the US EPA is already quite aware of Ferrate Treatment Technologies, with its 2-year investigative report (see the attached) on our effectiveness; and we feel this is important to bring to your attention and to those others who are involved in the project.

The Ferrator's Water Treatment Applications Perform At Any Flow Rate.

TREATABILITY RESULTS

Industrial/Mining Wastewater Treatability Test Results

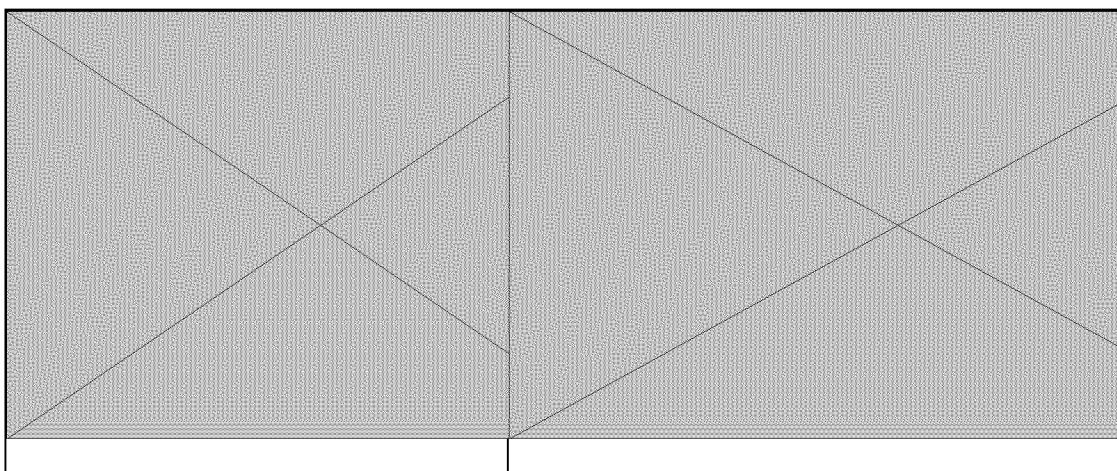
Ferrate Laboratory Treatability Tests incorporate proprietary Ferrate (Iron VI) Treatment System chemistries into a bench test under controlled conditions that are designed to meet treatment objectives specified by the client. The chemical modification or removal of target constituents is achieved by a combination of chemical reactions that can include oxidation, disinfection, complexation, or coagulation followed by the manipulation of one or more operational parameters such as pH adjustment, sedimentation, filtration and mixing.

Case Study 1 - Agricultural Stormwater

Objective: To reduce Total Phosphorus to the lowest achievable concentration, using the smallest dose of Ferrate.

Results: The raw water sample received was highly colored, and had a Total Phosphorus concentration estimated to be approximately 3 ppm (3,000 ppb). A Ferrate dose of 5 ppm with ferric chloride for pH adjustment reduced Total Phosphorus to <8 ppb (the private laboratory method's analytical detection limit).

	Raw Phosphorus	Ferrate Dose	Initial pH	Ferric Chloride Dose	Treated pH	Treated Total Phosphorus
Run 1	2.4 ppm	5 ppm	12.18	103 ppm	4.86	<0.008 ppm
Run 2	2.4 ppm	5 ppm	12.18	109 ppm	5.19	0.21 ppm



Case Study 2 - Lead Smelter

Objective: Reduced Lead (Pb) and Cadmium (Cd) concentrations to acceptable levels (≤ 10 ppb for Lead and ≤ 5 ppb for Cadmium).

Results: A Lead Smelter sample with 30.3 ppb Lead and 320 ppb Cadmium was reduced to 2.62 ppb Pb and 2.74 ppb Cd with a Ferrate dose of 10 ppm and pH adjustment to 10.3 – 10.4. This is 90% of their initial concentrations and a level well below reported discharge limits of 10 ppb Pb and 5 ppb Cd to meet compliance. Soluble concentrations for both metals were below 1 ppb.

Parameter	RAW	Ferrate Dose - 10 ppm
Total Lead (Pb) - ppb	30.3	2.62
Total Cadmium (Cd) - ppb	320.0	2.74
Soluble Lead (Pb) - ppb	1.8	0.19
Soluble Cadmium (Cd) - ppb	7.2	0.64
% Removal - Lead (Pb)	---	91.4
% Removal - Cadmium (Cd)	---	99.1

Case Study 3 - Cyanide Production Facility

Objective: Reduced the Total Cyanide concentration from 6.6 ppm to <1 ppm in the plant effluent.

Results: Ferrate was able to reduce the Total Cyanide concentration in the effluent to levels acceptable for environmental discharge, and could in fact reduce

Cyanide levels to below detection if needed.

Case Study 4 – Acid Mine Drainage

Objective: Reduced the concentrations of organics and metals including aluminum, iron, manganese, and nickel.

Results: With a dose of 2 ppm, Ferrate(VI) treatment was able to destroy >98% of the organic carbon (measured as UV254 absorbance), reduce turbidity to 0.3 NTU, and residual Al & Fe were reduced by greater than 99.7%, while Ni & Mn were reduced by 65% & 43%. The acid was neutralized by Ferrate's caustic.

Case Study 5 – Mining Wastewater

Objective: Verified Ferrate's ability to remove (via co-precipitation) toxic heavy metals; specifically Zinc (Zn) and Lead (Pb) from the wastewater to "extremely" low levels, so that the effluent would not pose any environmental or health risk. A useful standard for comparison would be the World Health Organization's Drinking Water Standards: Zn = 3,000 ppb, and Pb = 10 ppb.

Results: Ferrate reduced Zn by > 99.8% down to < 3 ppb, and Pb by > 99.9% down to < 0.1 ppb with a dose of 2 ppm or less. This represents a water quality level equal to 1/1000 of the Zn standard and 1/100 of the Pb standard for drinking water.

We're glad to address any questions that you or others may have, and we're sure you would require additional information from us.

Respectfully,

Ron Stone

Ferrate Treatment Technologies, LLC
Email: rstone@ferrate.biz
Direct: (323) 664-6562
<http://www.ferratetreatment.com>